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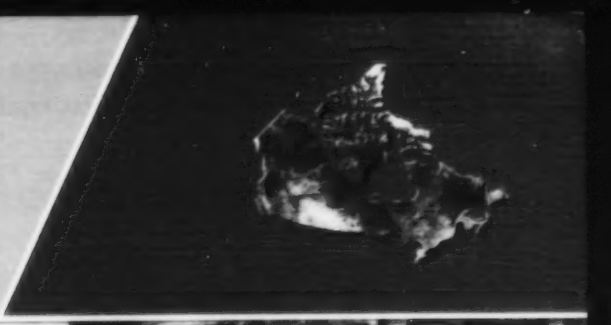

Science and Technology Research at the Canadian Forest Service • Pacific Forestry Centre

Helping communities protect themselves from post-infestation wildfire in British Columbia

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Litter nutrient balance dictates nitrogen release

Quality of plant litter determines decomposition patterns and their effects on soil nutrient availability, carbon sequestration and atmospheric carbon dioxide, according to a study by scientists from Duke University and Natural Resources Canada.

The study, which uses data from Natural Resources Canada's 12-year Canadian Intersite Decomposition Experiment (CIDET) and similar studies in the U.S. and Europe, identifies the initial carbon-to-nitrogen ratio in forest litter as a key factor in determining nitrogen dynamics during decomposition. According to the researchers, carbon-nitrogen ratios alter decomposers' respiration patterns and control the release of mineral nitrogen from litter into soil.

"Soil organisms that decompose plant matter with a high carbon–nitrogen ratio use a lot of carbon for energy," says Canadian Forest Service Research Scientist Tony Trofymow (ttrofymow@nrcan.gc.ca), a CIDET lead researcher and contributor in the Duke University study. "They need the energy to extract as much nitrogen as they can out of the litter."

As soil organisms digest and break plant matter down, they cause mineral nitrogen to be released. Mineral nitrogen is the form of nitrogen that plants use, so increased amounts in soil increase soil fertility.

As well, the more carbon the soil organisms feed on, the more carbon dioxide they release. Decomposers feeding on litter with lower carbon–nitrogen ratios work less for their nitrogen. They burn less carbon, and therefore potentially more carbon remains to be sequestered in soil.

The scientists used the data to develop a mathematical model to predict nitrogen-mineralization patterns applicable anywhere in the world, regardless of litter type.

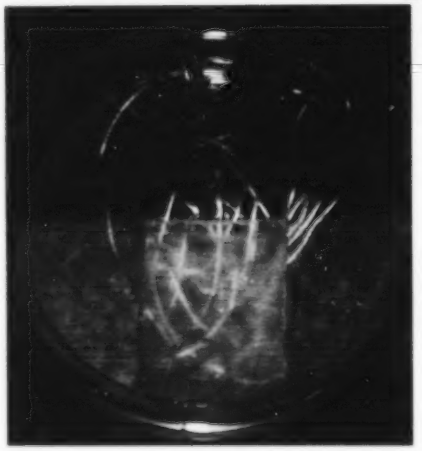
From 1992 to 2004, CIDET researchers examined long-term rates of litter decomposition and nutrient mineralization from 21 forested sites across Canada.

Technique allows look at host–fungus interaction

An inoculation technique refined at Natural Resources Canada's Pacific Forestry Centre is opening doors to understanding of how British Columbia conifers and root pathogens interact at the molecular level.

By sandwiching the roots of young lab-grown Douglas-fir seedlings between layers of mycelia-colonized agar, researchers can inoculate the roots with native forest root pathogen *Phellinus sulphurascens* (formerly *P. weirii*) under sterile conditions.

"Ideally you want to study the fungus and how it reacts with the host out in the field, under natural conditions," says study leader, Canadian Forest Service Research Scientist Rona Sturrock. "But there are so many other natural and environmental variables involved with that: it's very difficult to determine when the pathogen infected the roots, there's soil, there are other fungi and microorganisms...."



P. sulphurascens infects roots of very young Douglas-fir seedlings sandwiched between mycelia-colonized agar gel, allowing researchers to document the rate of infection and how the roots respond.

By controlling inoculation in the lab, Sturrock's team has been able to document how *P. sulphurascens* infects roots and how host roots respond. Sampling roots at regular time intervals after inoculation has revealed that the fungus penetrates root epidermal cells within three days, but that host response, at least for four specific pathogenesis-related proteins being investigated, takes a few days longer. The inoculation technique also enabled these researchers to determine where proteins tend to accumulate in host tissues.

"This kind of information provides signposts for what to look for and where when you sample infected roots collected either in the lab or field," Sturrock says.

Ultimately, she says, the inoculation technique will enable researchers to identify key defense-response genes in Douglas-fir, including those that might confer a degree of resistance to *Phellinus*. Tree breeders could then incorporate that information into their breeding programs, where resistance to root pathogens is a desirable trait.

Phellinus sulphurascens causes laminated root rot in Douglas-fir, an economically and ecologically valuable tree species in British Columbia. The disease can reduce productivity and harvestable yield of managed stands by as much as 40 to 70 percent through mortality, growth reduction, and butt rot.

Sturrock's team adapted the controlled-inoculation technique from methods used in Sweden and elsewhere to study infection processes and host-pathogen interactions of similar root-rot fungi. The refined inoculation technique may also work with *Armillaria ostoyae*, another widespread and serious pathogen affecting Douglas-fir in western North America.

Sources, this page

"The Global Stoichiometry of Litter Nitrogen Mineralization" appeared in the August 1 2008 issue of *Science*.

"Host–Pathogen Interactions in Douglas-Fir Seedlings Infected by *Phellinus sulphurascens*" was published in *Phytopathology* (Vol. 97, No. 11). It can be ordered from the Canadian Forest Service online bookstore.

Reducing the beetle's threats to public safety

Wildfire risk near Kelowna increased as the mountain pine beetle infestation moves south. In 2003, wildfire on neighbouring Okanagan Mountain spread into the city. Photo: ©TreePhoto-Fotolia.com

Having had wildfire sweep through parts of their city in 2003, residents of Kelowna, British Columbia, are well-sensitized to wildfire risk. Immediately after those events five years ago, awareness about community wildfire protection and fuel management plans increased dramatically. Most wildfire concern since then has focused on risk of lightning strike and irresponsible human behaviour.

Today, concern centres on a minuscule insect. British Columbia's mountain pine beetle infestation has moved into the region, and city employees and residents are adjusting existing plans to manage increased, beetle-caused wildfire risk.

"We're identifying areas where the beetle is already attacking, and where we think it's going to attack," says City of Kelowna Urban Forestry Specialist Ian Wilson, "and we're integrating our fuel management plan with what happens with the beetle. The beetle will be shaping a lot of our activities over the next few years."

The city received $80,000 this year from the Community Wildfire Protection Element of the Federal Mountain Pine Beetle Program to assist with the increased fuel management requirements.

"It costs us, on average, $200 per tree to remove dead and dying trees," says Wilson, "so this funding really, really helps."

To date, the federal government has provided $2.26 million over two years to communities in beetle-affected areas to help with costs of completing wildfire protection plans and reducing forest fuel loads to manage wildfire risk. The program complements the Union of British Columbia Municipalities (UBCM) Strategic Wildfire Protection Program.

Under the federal beetle program, "a community in the beetle-affected area can apply for up to $100,000 in each fiscal year," says **Dave Harrison** (daharris@nrcan.gc.ca), Mountain Pine Beetle Program Operations Manager. The federal funds can be used for planning, forest fuel reduction and removal, and stand management treatments on municipal-owned lands.

The Community Wildfire Protection Element is just one part of the Federal Mountain Pine Beetle Program that supports communities seeking to reduce threats to community safety caused by the beetle infestation.

The Thompson-Nicola Regional District used funds from the Hazard Tree Removal from Municipal Lands Element to remove beetle-killed trees from Eleanor Lake Park, located in the centre of Blue River. With ball diamonds, a beach, and swimming areas, the park is very busy from May to September.

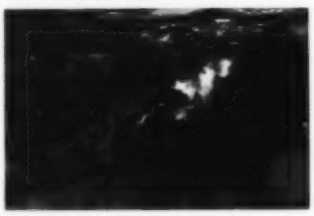
"If we hadn't been able to remove the trees, we would have had to close the park," says Agnese Saat, of the Thompson Nicola Regional District.

The Federal Mountain Pine Beetle Program also dedicates funds to support First Nations within the beetle zone. Under the First Nations element, a total of $3 million is available this year to First Nations communities who wish to reduce community fire and safety risks from beetle-affected trees and forests on their lands. Each band or tribal council may apply for annual funding for wildfire protection planning, forest fuel reduction, stand management treatments, and hazard tree removal.

Federal mountain pine beetle public safety funding for 2008–09

- Community Wildfire Protection: $1.2 million to assist beetle-affected communities to manage wildfire risk.
- Community Hazard Tree Removal: $800,000 to remove dangerous, beetle-killed trees on municipal and school lands.
- Recreation Site Hazard Tree Removal: $750,000 to remove dangerous, beetle-killed trees on provincially designated recreation sites and trails.
- First Nations Wildfire Protection: $3 million to manage wildfire risk and hazard trees on beetle-affected First Nations forest lands.

On the cover



Beetle-killed trees near and within urban areas pose a serious risk to public safety. Photo: British Columbia Ministry of Forests, Kevin Buxton

Source

Detailed information on the Federal Mountain Pine Beetle Program is available at http://mpb.cfs.nrcan.gc.ca/protect/index_e.html

Cold storage prolongs shelf life of salvaged logs

We use cold storage to preserve fruit, vegetables and meat. Why not do the same for trees attacked by the mountain pine beetle?

That's the question being explored by a team of scientists led by Research Scientist **Roger Whitehead**, at Natural Resources Canada's Canadian Wood Fibre Centre in Victoria, British Columbia. Their work may lead to a novel approach to dealing with the effects of the beetle's infestation of Canada's western forests.

"Cold storage could help communities and industry through a very difficult situation," says Whitehead (rwhitehe@nrcan.gc.ca). "It could increase the value we get from trees killed by mountain pine beetle and also slow the expansion of the outbreak."

The idea of cold storage for logs comes from Finland, where more than three million cubic metres of timber are stored under snow every year to preserve wood quality. This technique is being adopted in other countries, and some mills in eastern Canada have already implemented it.

The procedure is straightforward: harvest freshly killed or beetle-infested trees in the winter, cover the logs with snow, pack it down, and top it off with a layer of bark or sawdust as insulation. Then, in the summer a year or two later, remove the insulation, let the snow melt, and the logs are fully preserved.

"Keeping logs frozen until processing also keeps the beetles dormant," Whitehead explains. "And as long as the logs are milled within about six weeks of thawing, the beetle cannot develop enough to invade new trees."

Source

The report, *Storing beetle-killed logs under snow to reduce losses after mountain pine beetle attack*, is available from the Canadian Forest Service online bookstore.

This approach could benefit Canada's western and boreal forests. Last year, British Columbia's Forest Investment Account funded scientists from the Wood Fibre Centre and FPInnovations in Vancouver and Montreal to study cold storage. Led by Whitehead, the group visited mills in Finland and eastern Canada to explore how cold log storage could be used for beetle-killed logs. The report they presented to forestry managers in government and industry suggests three practical applications for this technique in western Canada.

It could slow the spread of the mountain pine beetle. Newly infested trees that are logged in the winter often aren't milled before the summer, by which time the beetle larvae have matured and are ready to infest new trees. Consequently, as Canadian Forest Service Research Scientist **Barry Cooke** (bcooke@nrcan.gc.ca) notes, "storing infested logs under snow could be a very useful tool to slow the spread of beetles into new areas."

Secondly, it would preserve the inherent quality and commercial value of the timber. If dead trees are left standing too long, they dry out and develop cracks. Because cold storage prevents moisture loss, this technique could extend the economic shelf life of beetle-killed logs.

Thirdly, it may help communities and mills adjust to lower levels of local timber supply. The market downturn resulting from the beetle infestation has led to mill closures and cutbacks in communities throughout western Canada. While harvesting has dropped correspondingly, the beetles continue attacking future timber supplies.

To counter this problem, and to retrieve the value of beetle-attacked trees, the Canadian Wood Fibre Centre–FPInnovations report advises maintaining an aggressive harvest to place stockpiles of logs in long-term—up to five years—cold storage. "Dead trees on the landscape lose value very rapidly," says Whitehead. "If long-term cold storage could be successfully implemented, high-value logs will be available for processing when market conditions improve and good-quality sawlogs are in short supply."

The methods identified in the report have generated interest in British Columbia and Alberta. Canadian Wood Fibre Centre and FPInnovations staff are sharing their expertise with the provinces and industry as they assess how cold storage of salvage logs might be implemented in their areas of operation.

Ski-hill snow guns are used to cover a tightly packed pile of spruce sawlogs with artificial snow near Kaipola, Finland.

Seeking sustainable solutions to sector challenges

A new program by Natural Resources Canada is helping communities to develop tools, approaches and strategies to respond to challenges faced by the Canada's forest sector in recent years.

The $25-million Forest Communities Program provides initial five-year funding to 11 forest-based community organizations across Canada, including two in British Columbia.

Organizations such as Prince George–based Resources North and Vancouver Island–based Nuu-chah-nulth Central Regional Management Board and Ecotrust Canada are using the money to capitalize on emerging forest-based opportunities and to develop and share knowledge, tools and strategies to help local economies as the forest sector evolves.

"Increased energy costs, increasing international competition, reduced timber supplies and a volatile economy have all affected Canada's forest sector and forest-dependent communities," says Canadian Forest Service Collaborate Forestry Program Manager **Nello Cataldo**. The Forest Communities Program seeks to help forest-dependent communities maintain their social, economic and ecological sustainability by encouraging stakeholders to work out solutions together.

Cataldo points out that in British Columbia the situation for many communities is compounded by the mountain pine beetle infestation. The infestation affects 11.5 million hectares of the province's interior pine forests.

Resources North Association is working with communities and industry in northern British Columbia to ensure social, economic and environmental sustainability needs are integrated into land and resource management.

"We're bringing stakeholders to the table to discuss solutions that provide long-term benefits, reduce environmental impacts and facilitate analysis and decision making that considers sector and community needs," says Resources North General Manager Kathi Zimmerman, who oversees the Forest Communities Program for a region stretching from Prince George, north through the Peace River watershed and east to the town of Houston. Resources North merges the Integrated Resource Management Business Group and the former McGregor Model Forest. Projects include piloting integrated resource management studies, examining opportunities for economic diversification, alternative energy sources, agroforestry and other alternatives to the traditional forestry sector. Resources North also continues their work on the Northern Climate Change Network, providing information to communities on how they may best adapt to climate change, and supports partner projects on caribou habitat research and the effects of the mountain pine beetle infestation on hydrology, soils and riparian areas.

Communities under the Forest Community Program seek to develop economic, environmental and social sustainability. Meares Island (above) falls within the jurisdiction of the Clayoquot Forest Communities Program in British Columbia.

On the coast, the Clayoquot Forest Communities Program brings together five First Nations under the Nuu-Chah-Nulth Central Regional Management Board, two municipal districts and Ecotrust Canada, a non-profit organisation whose purpose is to build conservation economies in forest communities. Although not affected by the mountain pine beetle infestation, communities there are dealing with the collapse of the fisheries and forest industry. In remote areas, more than 70 per cent of the workforce is unemployed.

Elmer Frank, Forest Communities Program Manager in Tofino, says, "Clayoquot Sound is a rich area in terms of its culture, biodiversity, natural resources and workforce. Our challenge is to work together as communities to build a more diversified and resilient local economy."

First-year projects will focus on developing strategic partnerships, building strong regional institutions and collaborative partnerships, as well as on economic diversification and pioneering an ecosystem-based management approach to forestry in the area.

Each organization will receive $1.475 million in funding through the program over the next five years. Matched funding from other collaborating organizations is required.

The Forest Communities Program replaces Natural Resources Canada's 15-year Model Forest Program, which ended in 2007.

Source

Information about the Forest Communities Program can be viewed at http://cfs.nrcan.gc.ca/index/fcpgm

40-year investment pays off for Shawnigan research

Source

More information about the Shawnigan Lake Research Forest can be viewed at http://cfs.nrcan.gc.ca/subsite/shawnigan.

With trees maturing in a space of years twice as long as the working careers of scientists, investing in the long term is critical for forest research.

The Shawnigan Lake Research Forest, located near Shawnigan Lake on Vancouver Island, is an example of how long-term planning across generations of researchers eventually pays off. In fact, due to its unique conception, the research forest is emerging as one of the crown jewels for Natural Resources Canada's recently established Canadian Wood Fibre Centre.

The Canadian Forest Service set up the site at Shawnigan Lake in 1971 at the request of the Forest Fertilization Board of British Columbia. Researchers wanted information on how Douglas-fir responds to fertilization. "The question was 'How can we make second-growth forests grow faster and better?'" says fibre centre Research Scientist **Al Mitchell** (amitchell@nrcan.gc.ca).

Researchers established a series of plots with a variety of treatments to study the biological basis for short-term and long-term effects of thinning, fertilization, and a combination of the two, on Douglas-fir trees. This approach helped unravel why different sites respond so differently to thinning and fertilization.

Now, nearly four decades later, the years of consistently collected and recorded data can be used to help answer today's important questions.

As the Canadian Wood Fibre Centre turns its attention from investigating wood quantity to looking into wood quality, Mitchell says, "Places like this are proving to be treasure troves of useful information. Now we can go back and ask new questions."

The value in the Shawnigan research forest goes far beyond studies led by Canadian Forest Service and British Columbia scientists. The data collected from the site represent a resource for all forest researchers. Renée Brooks, a U.S. Environmental Protection Agency scientist from Corvallis, Oregon, sees the Shawnigan project as a unique opportunity to work on environmental and sustainability issues around water and nutrients.

"It's invaluable for my science," she says. "I can't use just any random forest stand for my research. At the same time, I can't wait 20 or 30 years to conduct my own study."

Having the foresight to set up installations such as Shawnigan Lake Research Forest is a challenge researchers will always face.

"A long-term research project should be established to answer questions of both today and the future," Mitchell says. "Can we ask the right questions and answer unanticipated ones too?"

To date, 80 publications and reports highlighting the work at the Shawnigan Lake Research Forest have been produced over the years. "This site contains such a legacy of research, data and information, there will most certainly be more papers and spin-off analyses to come," Mitchell says.

Over 40 years, the government has invested more than $1 million in the site.

"We need to capitalize on the investments made in past years in research projects like Shawnigan," says Mitchell. "It takes time to set these things up, but it is worth it."

Eventually, they provide a jackpot of long-term results that researchers can draw on over the short term.

Canadian Wood Fibre Centre Research Scientist Al Mitchell orients fellow researchers to the 40-year-old Shawnigan Lake Research Forest.

People

Arrivals

Welcome to **Kami Ramcharan**, Director General for Pacific Forestry Centre as of September 17. The former Director General, Diversity Division at the Canada Public Service Agency in Ottawa, Ramcharan is a graduate of the Accelerated Executive Development Program and has had diverse experience in both regions and the National Capital Region with Public Safety and Emergency Preparedness, Corrections Canada, Indian and Northern Affairs and Heritage. Most recently, Kami led the Strategic Review exercise for the Canada Public Service Agency.

Departures

Gary Hogan, long-time director of the Forest Biology Program and recent acting Director General at the Pacific Forestry Centre, turned in his key and cleaned out his desk in October. After 36 years of research and management with the Canadian Forest Service, he is moving on to other challenges, including relaxing and spending more time with family.

After a long and illustrious career of trapping, rearing, pinning and mounting insects of all sizes, shapes, and descriptions (with special emphasis on beetles and moths), along with maintaining and analyzing insect and biodiversity databases, Technician **Jane Seed** retired in November.

Soil Chemistry Research Scientist **Caroline Preston** recently celebrated 30 years of research by pulling the plug on her work with the Canadian Forest Service and her nuclear magnetic resonance spectroscopy machine to join the ranks of Natural Resources Canada's Emeritus researchers.

Best wishes to Policy Analyst **Karen Leslie**, who left the Pacific Forestry Centre to take a position with the Water Stewardship Division of the British Columbia Ministry of Environment. During her three years with the Canadian Forest Service, Leslie helped facilitate development of the National Forest Pest Strategy.

Accolades

Kudos once again to Research Scientist **Werner Kurz**, recipient of a 2008 Public Service Award of Excellence in Innovation. The award recognizes federal employees who have demonstrated excellence in serving Canadians, while reflecting the values, ethics and priorities of the Government of Canada. Kurz received the award for advancing scientific understanding of forests and increasing Canada's international reputation.

At the 2008 Annual Meeting of the Canadian Society of Soil Science (CSSS), Soil Chemistry Research Scientist **Caroline Preston** was presented with a CSSS Fellow Award. Preston has worked in many aspects of soil organic chemistry and spectroscopy, isotopic analysis, nitrogen and phosphorus nutrition, organic wastes, and carbon stabilization, first with Agriculture Canada, and since 1986 with the Canadian Forest Service. She is the second woman to receive this award. Preston says she feels honoured to have been nominated by Dr. Scott X. Chang, of the University of Alberta, a former student who did much of his doctoral research at the Pacific Forestry Centre.

Kami Ramcharan takes the helm at Pacific Forestry Centre.

Gary Hogan retires.

Caroline Preston received a fellowship award at the 2008 Canadian Society of Soil Science meeting.

Events

Celebrating Our Past: Shaping Our Future
The 66th Annual Truck Loggers Association Convention & Trade show
January 13–16, 2009
Vancouver
www.tla.ca/toolkit.asp?pg=2009_CONVENTION_AND_TR

ExpoFor 2009
Association of BC Forest Professionals Annual Conference and AGM
February 26–27, 2009
Prince George, BC
www.abcfp.ca

2009 COFI Convention
Council of Forest Industries
April 1-3, 2009
Prince George, BC
www.cofi.org

22nd Annual Global Forest & Paper Industry Conference
PricewaterhouseCoopers
May 14, 2009
Vancouver
www.pwc.com/forestconf09

2009 AGM and Conference
Canadian Institute of Forestry
September 21–23, 2009
Nanaimo, British Columbia
Contact: Michel Vallee - vancouver-island@cif-ifc.org

XIII World Forestry Congress
October 18–25, 2009
Buenos Aires, Argentina
www.wfc2009.org

New from the bookstore

Information Reports

Risk assessment of the threat of mountain pine beetle to Canada's boreal and eastern pine resources. Nealis, V.G. and Peter, B., compilers. Information Report BC-X-417.

Effect of commercial thinning on within-stand microclimate and fine fuel moisture conditions in a mature lodgepole pine stand in southeastern British Columbia. 2008. Whitehead, R.J. et al. Information Report FI-X-004.

Working papers

Assessment of the economic (pulping and pulp quality) effects of increased lodgepole pine in SPF chip mixtures. Dalpke, B. et al. Mountain Pine Beetle Initiative Working Paper 2007–08.

Exploring the spatial-temporal interaction of mountain pine beetle infestations. Robertson, C. et al. Mountain Pine Beetle Working Paper 2007–09.

Incorporating Present and Future Climatic Suitability into Decision Support Tools to Predict Geographic Spread of the Mountain Pine Beetle. 2008. Shore, T.L. et al. Mountain Pine Beetle Working Paper 2008–10.

Decay fungi and associated rates of decay in standing trees killed by mountain pine beetle. Breuil, C. Mountain Pine Beetle Working Paper 2008–11.

Minimizing the Impact of Mountain Pine Beetle Veneer on Plywood Glue Dry-Out and Delamination. Xu, H. et al. Mountain Pine Beetle Working Paper 2008–12.

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Dépistage précoce des espèces exotiques envahissantes. Sweeney, J.D.; Silk, P.J. Ressources naturelles Canada, Service canadien des forêts, Centre de foresterie de l'Atlantique, Fredericton (N.-B.). Note d'impact 48F.

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Les forêts du Canada: la biodiversité dans un monde en évolution (Trousse d'enseignement). Association forestière canadienne, Pembroke, Ontario.

Next issue ...
Assessing the threat of mountain pine beetle to the boreal forest
and
Monitoring urban forests for non-native forest pests

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bookstore.cfs.nrcan.gc.ca

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